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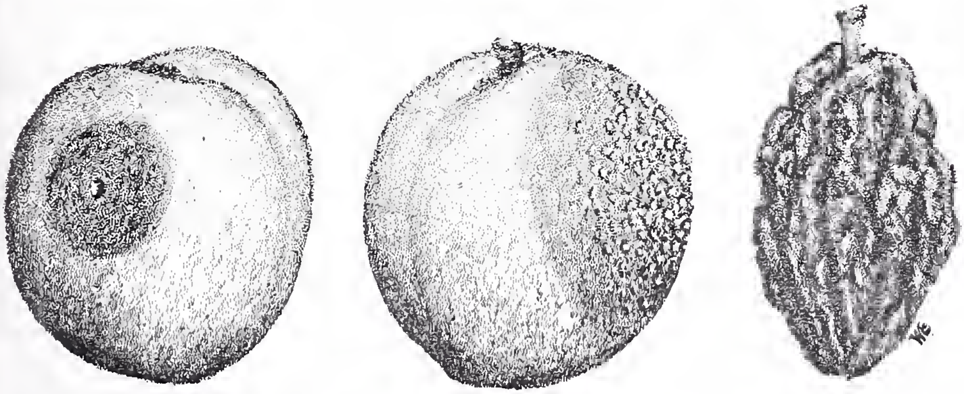

THE BROWN ROT OF STONE FRUITS

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HARRISBURG, PA.
1920.

SOME OUTSTANDING FEATURES OF BROWN ROT.

About *a million bushels of peaches* are grown in Pennsylvania each year.

It is estimated that brown rot causes a *fifteen per cent yearly loss* in this crop.

This means *nearly a half million dollars* loss to the peach industry of the state.

Brown rot loss in early peaches often amounts to *one-third to one-half* of the crop.

Brown rot *shortens the radius of distribution;* peaches can not be shipped to any great distance on account of danger from rot in transit.

Brown rot *congests the market,* with a consequent reduction of prices.

Brown rot *hurries the picking* of the fruit, which must be quickly gathered and disposed of at maturity or it will be lost.

Brown rot also encourages the *marketing of unripe fruit* in a frantic effort to forestall the rot.

BROWN ROT ON PEACHES.

The brown rot epidemic of 1919 on peaches and cherries has brought to this office a great number of inquiries from peach growers all over the state as to measures that may be taken to control this disease. This circular is issued as an answer to such inquiries as well as for others interested in the rot.

While the disease is so well known on the fruit that it scarcely needs description, there are a number of features of it that should be more clearly understood by peach growers in general, since it is only when these points are given their proper importance that control measures can be intelligently carried out.

(1) Brown rot is due to a fungus which is minute and microscopic in character, but which has just as definite a mode of life as a thistle or a potato or any other plant.

(2) It grows within the fruit or other parts and destroys the tissue in order to get its food; hence the rot.

(3) Like ordinary plants the fungus grows most rapidly in warm weather; thus rot develops quickly in warm places, while cool conditions retard it.

(4) The rot starts most readily at a break in the peach skin, consequently wounds and bruises, and especially curculio punctures almost invariably start rot spots.

(5) When mature, the fungus produces spores in tufts on the surface of the rotted fruit; these spores though very small are for the fungus just what seeds are for weeds and other plants—a means of spread and multiplication.

(6) The spores are distributed in various ways; they may be blown about by wind or spattered by rain, or carried by handling.

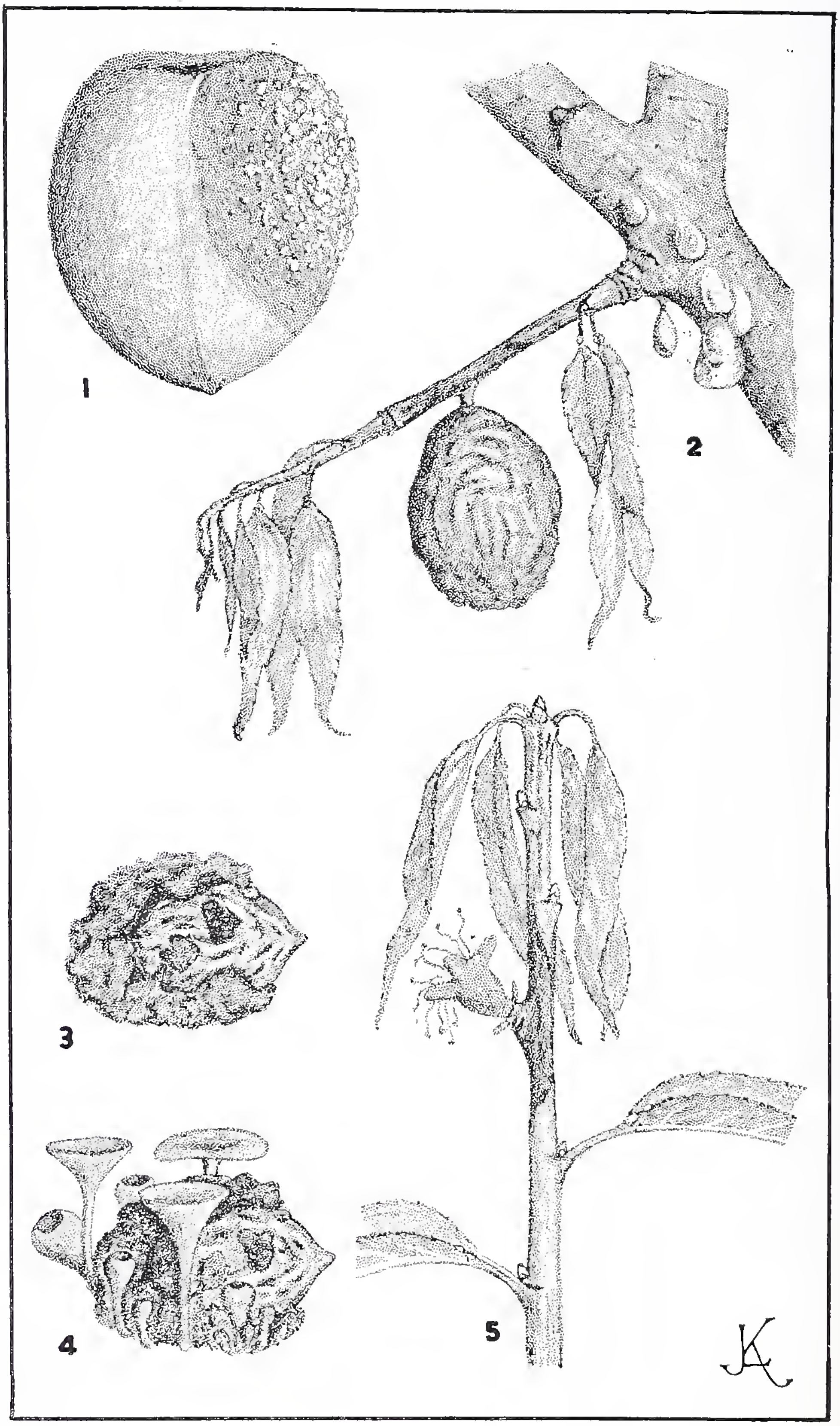
(7) They are produced in countless numbers. *On a single rotten peach there may be several millions of them.* This power of spore production makes our most prolific ordinary plants or weeds look like lazy loafers.

(8) While weeds and crop plants have only one generation in a summer, the brown rot fungus may have a dozen or more. Starting from a spore much as seeds do in soil, it goes through its period of growth and development in the fruit in three or four days, at the end of which time it has produced its millions of spores, any one of which is capable of growing immediately and thus beginning another generation on some other fruit.

(9) These spores need for their germination the same condition as seeds—air, warmth and moisture. Without rain or dew they are helpless to start their growth.

(10) Sunlight kills these spores within a few days; if they are exposed to light they soon perish.

(11) When a peach is rotted the fungus does not immediately die within it. Just as many plants have underground parts which keep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them alive over winter, so the fungus remains alive over winter in the rotten fruit on the tree, and starts spore production again in any warm, moist period.

(12) In the rotten fruit which falls to the ground the fungus also remains alive, but undergoes a profound change in its nature. It fills the rotted fruit with tough, hard black masses which will stay dormant in the soil for years. In spring those near the surface produce small, tan-colored, trumpet-shaped growths in which immense numbers of spores are formed. This stage comes only in spring at blossoming time, and it may start the disease on the blossoms and young fruit.

CONTROL—AN ALL YEAR JOB.

If these features in the life history of the fungus are given due consideration it will be apparent that the brown rot disease is not a chance thing which appears from nowhere about the time the fruit is ripe and then mysteriously disappears, but it is a seasonal disease, wintering in the rotted fruit, starting in the blossoms in spring, and then passing from fruit to fruit until it reaches its climax of development in the ripe fruit. To control an enemy of this type demands more than a spasmodic effort in the picking season—*it is an all-year job.* It must be begun in the dormant season and continued through the year, and it should be emphasized that *spraying is only one of the methods* that must be employed to check it.

METHODS FOR THE CONTROL OF BROWN ROT.

(1) *Knock off all mummied fruit* when pruning the trees; the fungus is still alive in these and will start into activity and spread the disease in the new crop in any moist, warm period.

(2) *Prune in open fashion* so as to permit air and sunlight to penetrate to every part of the tree. The seed-like spores of the rot

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Explanation of Plate.

(1) A partly rotted peach; the spore-bearing pustules of the fungus are dotted over the rotted surface.
(2) A "mummied" peach which has rotted on the tree, and has killed the twig and the limb tissue around its base. Drops of gum often exude from the injured tissue.
(3) Black, tough sclerotial mass of fungus tissue formed in rotten fruit on the ground.
(4) The spring stage of the fungus growing from the fruits rotted into sclerotia on the ground.
(5) A blossom killed and its twig girdled as a result of infection coming from the spring stage noted in fig. 4.

fungus are readily killed by light, and open pruning hastens drying out after showers and heavy dew.

(3) *Plow in fall or early spring* before the blossoms open; rotten fruits on the ground or in the surface soil also retain the fungus in a living condition and spores from the spring stage on these can start the disease on blossoms and young fruit. Besides killing many blossoms such early attacks establish the fungus all over the orchard for the season. Plowing early prevents this spring infection for that year.

(4) *Thinning the fruit* so that the peaches do not touch each other will prevent much spreading of the rot from contact, a very common occurrence in clustered fruit.

(5) *Keep down weeds;* they provide shade and moisture, both of which are favorable to the rot fungus.

(6) *Take off the rotten fruits* at picking time. If left on the tree they can more easily spread the spores to clean fruit, and besides they often kill back limbs and start cankers.

(7) *Do not handle clean and rotted fruit* at the same time. The brown, dusty coat on the surface of the rotted fruit is made up of *several millions of spores,* any one of which is capable of starting rot in a clean peach. Indiscriminate handling transfers these spores. For similar reasons rotten peaches should not be allowed to lie around the packing house since wind or even light air currents can carry the spores to the clean fruit. Bury or cover them or take them away to some distance.

(8) *Keep the fruit cool.* Chilling or cooling as soon as picked, packing under shade, hauling under canvas cover, shipping in cooled cars, and storing at low temperatures—all help materially in reducing loss from rot. The fungus grows slowly at low temperatures, and cool conditions after picking often enable a shipment to reach the consumer in good condition, when otherwise it would be hopelessly rotted.

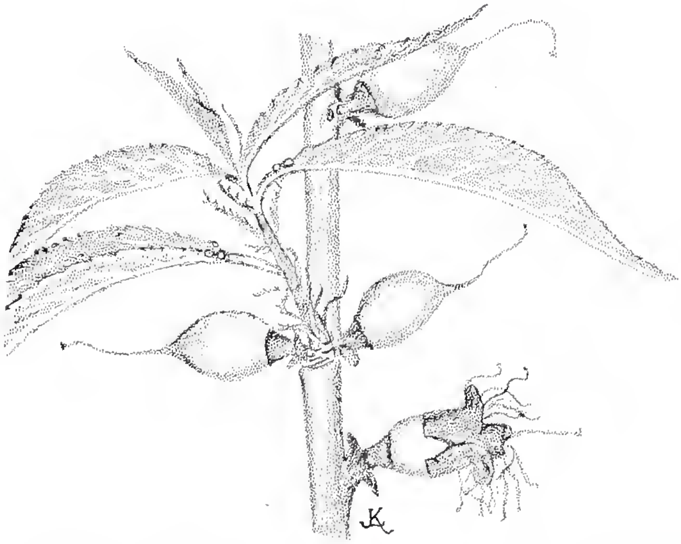

Figure 1.—Young peaches at the proper stage for giving the after-blossom spray.

(9) *Spraying or dusting methods* are intended to protect the fruit from becoming infected during the growing period. Such infection very frequently takes place at curculio injuries, and where curculio is present its control will always be an important factor in preventing rot.

Self-boiled lime sulphur, 8-8-50, is the standard spray material for peach brown rot. Some growers use *lime sulphur* 1-80 or even 1-60, but there is always such a great risk of burning the foliage with this that it can not be generally recommended. *Dusting sulphur* may also be used with success; a 90-10 mixture of the dust and powdered lead arsenate is usually employed.

Spray or dust applications should be given,—

(1) When the shucks have all, or nearly all fallen (See fig. 1). Poison for curculio should be added; use lead arsenate, powdered 2 lbs., or paste 4 lbs., for every fifty gallons.
(2) About two weeks later, with poison also included.
(3) About two weeks before the early peaches ripen, without poison.
(4) About ten days before the late peaches ripen, also without poison.

While the above schedule is the one recommended for brown rot it will also answer for *peach scab* with the addition of a dormant spraying in early spring before the buds burst—an application which is usually advisable in any case as a protection against *leaf curl*. Since the scab organism winters to a large extent in shallow spots on peach twigs this early spring spray kills most of it before it has any chance to cause infection. For this dormant spray there may be used lime sulphur, 1-16, except where San Jose scale is present, in which case a 1-9 solution is necessary.

BROWN ROT IN CHERRIES.

Sweet cherries rot very badly in moist, warm weather and the losses in this crop are even greater than in peaches. The disease is identical with that on the peach, and since the fungus winters in the mummies on the trees and in the rotten fruit on the ground, attacks the blossoms very readily, and has the same relations to moisture, shade and temperature as in the peach, the same general methods of control are necessary.

After the dormant spray in spring given just before the buds burst, the later sprayings may be safely done with lime-sulphur 1-40, or a 3-3-50 Bordeaux mixture, or self-boiled lime sulphur, or sulphur dust. Apply these (1) just as the shucks are being cast with poison added; (2) just before the fruit begins to color, without poison.

BROWN ROT IN PLUMS.

The spraying schedule given for the peach is also satisfactory on plums. For the applications given after blossoming lime sulphur, 1-40, can be used on European plums but not on American or Japanese varieties because of the danger of burning the foliage. Self-boiled lime sulphur is advised for these latter types.

How to Make Self-boiled Lime Sulphur.

Quick-lime or stone lime (freshly burnt and not air-slaked),	8 lbs.
Sulphur,	8 lbs.
Water,	50 gals.

Make up in proportion for larger amounts.

Place the lime in a barrel or other vessel and add enough water to slake. As slaking begins add the sulphur and stir, keeping the mass moist but not flooded. When slaking is complete after a few minutes and a reddish color begins to appear, dilute at once with cold water to the required amount, *strain* into the tank and use immediately. Careful straining is most important to prevent clogging of nozzles.

How to Make Bordeaux Mixture.

The standard formula, 4-4-50, calls for

Bluestone (copper sulphate),	4 lbs.
Lime (fresh stone lime, not air-slaked),	4 lbs.
Water,	50 gals.

For modifications of this as 3-3-50, take the smaller amounts of bluestone and lime indicated.

(1) Slake the lime in a barrel or other vessel, adding water as needed, but do not flood it. When completely slaked add water to make 25 gallons.

(2) Dissolve the bluestone in hot water and then dilute to 25 gallons, or suspend it in a coarse sack over night at the top of the water in a barrel.

For use stir the lime solution well and take equal parts of the lime and bluestone solutions; mix these, strain the mixture through a fine screen, and use the same day.

If large amounts of Bordeaux are needed write for circular giving methods of preparation.